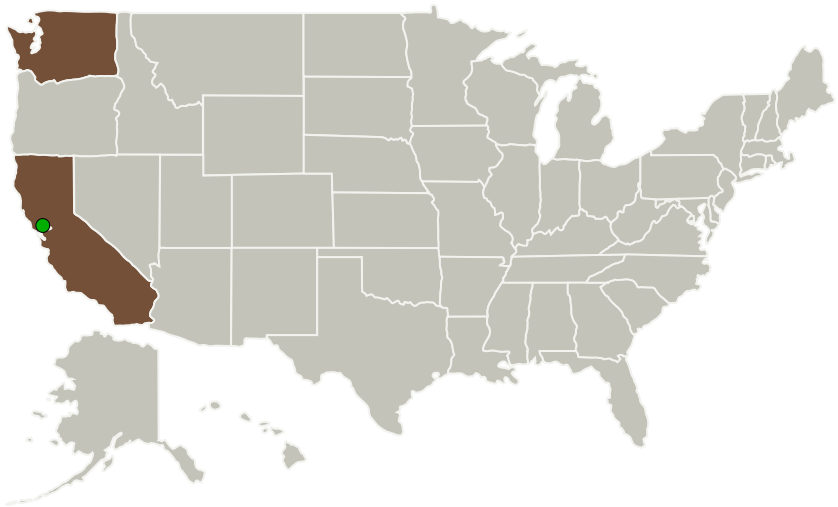
PowerCube: Integrated Power, Propulsion, and Pointing for CubeSats, Phase I

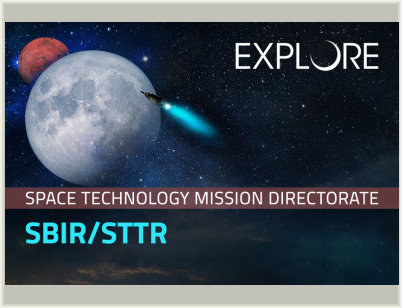
Completed Technology Project (2011 - 2011)

Project Introduction

Tethers Unlimited, Inc. proposes to develop the PowerCube, an integrated power, propulsion, and pointing solution for CubeSats. The PowerCube combines three innovative components: a high-power deployable solar array able to provide up to 100W peak power to the CubeSat, a regenerative fuel cell energy storage system that doubles as a gH2/gO2 thruster, and a 'carpal joint' gimbal that enables sun pointing of the solar panel as well as precise pointing of payloads. This highly integrated system will provide power generation, power storage, propulsion, attitude control, and payload pointing capabilities that will enable the CubeSat platform to be used to perform missions previously possible only on much larger platforms. Our Phase I effort will focus on design and implementation of the regenerative fuel cell/thruster component, with the objective of maximizing orbit average power capabilities, and in the Phase II effort we will combine this power storage/propulsion technology with deployable panel and gimbal technologies we are currently developing under a separate program to create the PowerCube system. This highly-integrated, compact subsystem will provide order-of-magnitude performance improvements in several metrics for CubeSats, enabling this low-cost platform to perform challenging science and exploration missions that previously could only be accomplished by much larger spacecraft.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Tethers Unlimited Inc	Lead Organization	Industry	
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Washington

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140214)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Tethers Unlimited Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Robert P Hoyt

Co-Investigator:

Robert Hoyt

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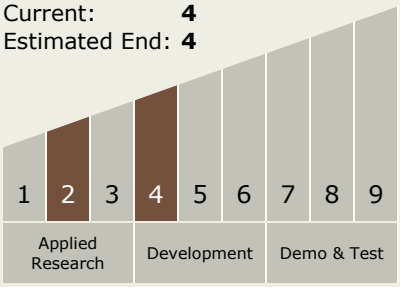
Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.2 Electrochemical: Fuel Cells

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System